

Flek, Vladislav; Hala, Martin; Mysikova, Martina

Working Paper

Youth labour flows and exits from unemployment in Great Recession

IES Working Paper, No. 6/2015

Provided in Cooperation with:

Charles University, Institute of Economic Studies (IES)

Suggested Citation: Flek, Vladislav; Hala, Martin; Mysikova, Martina (2015) : Youth labour flows and exits from unemployment in Great Recession, IES Working Paper, No. 6/2015, Charles University in Prague, Institute of Economic Studies (IES), Prague

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Institute of Economic Studies, Faculty of Social Sciences
Charles University in Prague

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Vladislav Flek
Martin Hala
Martina Mysikova

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Institute of Economic Studies,
Faculty of Social Sciences,
Charles University in Prague

[UK FSV – IES]

Opletalova 26
CZ-110 00, Prague
E-mail : ies@fsv.cuni.cz
<http://ies.fsv.cuni.cz>

Institut ekonomických studií
Fakulta sociálních věd
Univerzita Karlova v Praze

Opletalova 26
110 00 Praha 1

E-mail : ies@fsv.cuni.cz
<http://ies.fsv.cuni.cz>

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Bibliographic information:

Flek V., Hala M., Mysikova M. (2015). “Youth Labour Flows and Exits from Unemployment in Great Recession” IES Working Paper 6/2015. IES FSV. Charles University.

This paper can be downloaded at: <http://ies.fsv.cuni.cz>

Youth Labour Flows and Exits from Unemployment in Great Recession

Vladislav Flek^{a,b}

Martin Hala^{b,c}

Martina Mysikova^{b,d}

^aInstitute of Economic Studies, Faculty of Social Sciences, Charles University in Prague, Smetanovo nábřeží 6, 111 01 Prague 1, Czech Republic

Email: vladislav.flek@mup.cz

^bMetropolitan University Prague

^cUniversity of New York in Prague

Email: hala.mart@tiscali.cz

^dThe Institute of Sociology of the Czech Academy of Sciences

Email: martina.mysikova@centrum.cz

March 2015

Abstract:

Using Spain and the Czech Republic as examples of two EU countries with remarkably different youth labour market performance, we apply a gross flow analysis based on EU-SILC longitudinal data. While in Spain increases in youth unemployment rate are driven mostly by young people losing their jobs, in the Czech Republic, this is mainly due to new labour market entrants who failed to find a job. Furthermore, the analysis of flow transition rates suggests that the job-loss rates of young workers are persistently higher than those established for prime-age workers. But the analogous result applies, though less uniformly, also to the job-finding rates. Survival functions estimates point to prolonged unemployment duration and increasing long term unemployment, while both these tendencies apply relatively more to the young unemployed. Proportional hazard models generally indicate that shorter unemployment spells are more likely to be terminated by finding a job in comparison with those spells lasting for more than one year, while the hazard ratios for duration intervals under one year are typically higher for prime-age unemployed. Finally, we examine education, gender, household size, etc. as determinants of exits from unemployment, with uniform evidence found for tertiary education only.

Keywords: flow transition rates, gross labour market flows, hazard function, survival function, unemployment

JEL: E24, J6

Acknowledgements:

V. Flek and M. Mysikova have received funding from the European Union's 7th Framework Programme for research, technological development and demonstration (Grant Agreement no. 613256, project name: "Strategic Transitions for Youth Labour in Europe"). EU-SILC data were made available to the authors on the basis of contract no. EU-SILC/2012/66 between the European Commission, Eurostat, and Metropolitan University Prague. Our thanks are due to S. McGuinness, P. Mertlik, J. Vecernik, P. Zakova, and the working paper's referee for their comments and suggestions. However, the authors alone are responsible for the results.

1. Introduction

Many observers attempt to explain why young people suffer relatively more from unemployment. As shown by e.g. Quintini and Manfredi (2009); McGuinness and Wooden (2009); Blanchflower and Bell (2011); or ILO (2013), only a fraction of school-leavers and university graduates immediately manage to find a stable and satisfactory job. The rest is first faced with unemployment, or frequent job changes combined with the incidence of repeated unemployment spells. This situation is often attributed to educational mismatch on youth labour markets, to a lack of work experience and to the absence of firm-specific skills.

In addition, jobs held by young people tend to be less stable even if education, skills and other characteristics match the employer's requirements. Young employees are still more likely to be affected by layoffs, for instance because of the frequent practice of fixed-term labour contracts, the existence of seniority-weighted redundancy payments or last-in first-out rules.

The Great Recession has further amplified the already existing difficulties of young people on the labour market, a situation which results in further disproportionate increases in youth unemployment (Blanchflower and Bell, 2011; ECB 2012). Our main intention is to analyse these disproportions within a complex framework that would reveal the different patterns of labour market dynamics prevailing on youth and prime-age labour markets. A view offered in this paper is based on a *flow* approach, with the main focus on the following questions:

How exactly does the labour market dynamics, expressed by movements (flows) of young people between employment, unemployment and inactivity, differ from the dynamics among prime-age individuals? How does each of these movements shape the evolution of youth and prime-age unemployment? Do the most marked differences between young and prime-age individuals lie in chances to retain jobs, in probability of exiting unemployment, or in transitions between inactivity and labour market? Are the above noted differences typical for certain educational or gender group? And how did they evolve as the Great Recession deepened? To which extent is the acceleration in youth unemployment accompanied by adverse structural developments such as deepening duration dependence and marginalisation? What are the policy implications of our findings? Our methodology is in more detail described in Section 2.

In this paper we aspire on answering such questions for Spain and the Czech Republic in 2007–2010. Despite the substantial differences in unemployment rates, size of the two labour markets, institutional design and applied policies, youth unemployment rates in both countries approximately doubled during that period, while the upward aggregate (prime-age) unemployment rate evolutions were comparatively less rapid.¹

European flow analyses typically concern working-age population as a whole rather than youth and their sub-groups. One of the few exceptions known to us is Elsby *et al.* (2011), who deal explicitly with the flows of young people in the UK. In addition, the existing flow literature often lacks *international dimension* and/or *longitudinal structure* because of data limitations (Burda and Wyplosz, 1994; Bellmann *et al.*, 1995; Cazes and Nesporova, 2007; Gomes, 2009). In Section 3 we attempt to propose how to conduct international flow analyses by using the recent longitudinal micro data available from Statistics on Income and Living Conditions (EU-SILC). These data are then used for analysis in the sections to follow.

Section 4 deals with age-specific movements of people between employment, unemployment and inactivity. In the literature such movements are usually referred to as *gross flows* (Abowd

¹ OECD (2013, 2014) deal in detail with the specifics of Spanish/Czech labour markets.

and Zellner, 1985; Blanchard and Diamond, 1990) and serve as a proxy for measuring labour market fluidity.

In Section 5 the flow analysis enables us to demonstrate how do movements (flows) of people in and out of unemployment account for changes in unemployment rates (Shimer, 2007; Petrongolo and Pissarides, 2008; Dixon *et al.* 2011), and to point to possible systematic differences between young and prime-age individuals.

A related approach applied in Section 6 focuses on *flow transition rates* (transition probabilities) of moving between the three labour market states - employment, unemployment and inactivity (Blanchard and Diamond, 1990; Gomes 2009; Silverstone and Bell, 2010). Here we intend to account particularly for possible differences between *individual* labour market prospects of young workers of different gender and education.

In Section 7 we aim to explore survival functions and proportional hazard models (Kaplan and Meier 1956; Cox, 1972; Jenkins, 1997), to estimate the impact of unemployment duration on prospects to exit unemployment among the young and prime-age workers, along with a set of additional explanatory variables. Last section concludes.

2. The Methodology

In this section we present our approach to analysing gross labour market flows, flow transition rates and duration dependence. The analysis of gross labour market flows enables us to establish which flows are crucial for the entire labour market dynamics, which are comparable in size and which are just of minor importance (Blanchard and Diamond, 1990; Gomes, 2009). Then we proceed with an analysis of the link between gross flows and unemployment to identify the key drivers of unemployment dynamics (Dixon *et al.*, 2011). Which gross flows, and to which extent, are behind the observed unemployment increases? Is the role of the respective gross flows comparable across countries, time and age categories? This is of potential policy relevance since increasing unemployment can be a result of different relative contributions of particular gross flows. To maximise its impact any policy action aimed at unemployment reductions has to be structured accordingly.²

The analysis of differences between the flow transition rates of young and prime-age individuals is again of potential policy relevance as it clearly indicates from an individuals' perspective the gap between labour market prospects of these two age groups. Flow transition rates are treated here as a first-order Markov process, where the transitional probability of moving from previous to current labour market status depends exclusively on the individual's previous status (Blanchard and Diamond, 1990; Gomes, 2009; Silverstone and Bell, 2010; Elsby *et al.* 2011; ECB, 2012).

Finally, in this section we present our approach to analysing unemployment duration and its impact on the prospects to find a job. With increasing unemployment duration, job search intensity/efficiency declines as a result of frustration from unsuccessful search, exclusion from relevant social networks and unwillingness of firms to hire those stigmatised by loss of work skills and discipline. With such attitudes marginalised labour force emerges, whose employment prospects are a decreasing function of unemployment duration (Blanchard, 1999; Shimer, 2007).

Bell and Blanchflower (2011), Brauksa and Fadejeva (2013); or Kelly *et al.* (2013) point to the existence of duration dependence and marginalisation in youth unemployment during the Great Recession. Yet, cross-country comparisons as well as comparisons between the age groups are

² Elsby *et al.* (2011, p. 4) note that „... policy that focused on encouraging outflows from unemployment may not be as relevant in an economy in which rises in unemployment were driven by...outflows from employment.“

still rather scarce. First we introduce the methodology of estimating the Kaplan-Meier survival functions which provide a variety of comparative insights into unemployment durations of both age groups. Later we address the methodology of estimating proportional hazard models to indicate the probability to exit unemployment and move to employment in relation to previous unemployment duration, along with a set of additional explanatory variables. The estimates are performed separately for both of the analysed periods and countries as well as age groups of interest.

2.1 The Quantification of Gross Labour Market Flows

The calculation of gross flows involves the number of individuals entering the labour market from previous inactivity (I_{t-1}) and moving either into employment (E_t) or unemployment (U_t). It also captures those who leave employment (E_{t-1}) and move either into unemployment (U_t) or inactivity (I_t). Finally, there are people exiting unemployment (U_{t-1}) and moving either into employment (E_t) or inactivity (I_t). This gives us the following six gross flows, expressed as the number of individuals moving between the previous and current labour market statuses: ($E_{t-1} \rightarrow U_t$); ($E_{t-1} \rightarrow I_t$); ($U_{t-1} \rightarrow E_t$); ($U_{t-1} \rightarrow I_t$); ($I_{t-1} \rightarrow E_t$); ($I_{t-1} \rightarrow U_t$). In turn, the number of those who maintain their previous labour market status can be expressed as ($E_{t-1} \rightarrow E_t$); ($U_{t-1} \rightarrow U_t$); ($I_{t-1} \rightarrow I_t$).

Our weighted matched samples involve 23 monthly observations of gross labour market flows for the periods 2007–2008 and 2009–2010 (see Section 3 for details). Based on this information the average monthly numbers of individuals involved in each of the six gross flows or remaining in the previous labour market status can be calculated for each country, period and age group of interest. This is done in Tables 1.1.A – 1.8.A in Appendix. However, to compare the importance of each gross flow for the entire labour market dynamics, it is more illustrative to analyse the relative figures. In other words, the number of people involved in a particular gross labour market flow has to be divided by the total number of matched labour market stocks (Blanchard and Diamond, 1990; Gomes, 2009; Silverstone and Bell, 2010). Table 1 in Section 4 summarises such relative comparisons.³

2.2 The Link between Gross Labour Market Flows and Unemployment

Conventionally, changes in the number of unemployed (ΔU) can be expressed as the first difference between unemployment *stocks* at times t and $(t - 1)$. However, following the *flow* literature, we express (ΔU) as a balance of gross flows “in” and “out” of unemployment:

$$\Delta U = \left[\frac{(E_{t-1} \rightarrow U_t) + (I_{t-1} \rightarrow U_t)}{\text{IN}} \right] - \left[\frac{(U_{t-1} \rightarrow I_t) + (U_{t-1} \rightarrow E_t)}{\text{OUT}} \right]. \quad (1)$$

Tables 2–3 in Section 5 document how these gross flows shape the evolution of unemployment (net change in the number of unemployed). Furthermore, a change between unemployment rates recorded at times t and $(t - 1)$ can be expressed as $\Delta \left(\frac{U}{LF} \right) = \frac{U_t}{LF_t} - \frac{U_{t-1}}{LF_{t-1}}$, where the labour force (LF) consists of the employed and the unemployed. From formula (1) it is evident

³ In Table 1 in Section 4, $UE = (U_{t-1} \rightarrow E_t) / (E_{t-1} + U_{t-1} + I_{t-1})$. UE indicates in per cent the proportion of total young or prime-age individuals involved, on average, every month in a gross flow from unemployment to employment, and so on for EU , EI ... The results in Table 1 are based on figures presented in Tables 1.1.A–1.8.A in Appendix. For instance, for the Czech Republic in the period 2007–2008, the relative share of young people who leave every month the unemployment status and move into employment represents, on average, 0.36% of total matched labour market stocks of the youth: $UE = (4,073; 1,130,974) \cdot 100 = 0.36\%$ (see Table 1.5.A).

that $U_t = \Delta U + U_{t-1} = (IN - OUT) + U_{t-1}$, and a change in the unemployment rate can therefore be expressed as follows:

$$\Delta \left(\frac{U}{LF} \right) = \frac{(IN-OUT)}{LF_t} + \frac{U_{t-1}}{LF_t} - \frac{U_{t-1}}{LF_{t-1}} = \frac{(IN-OUT)}{LF_t} + U_{t-1} \left(\frac{1}{LF_t} - \frac{1}{LF_{t-1}} \right). \quad (2)$$

Formula (2) defines in percentage points which fraction of changes in the unemployment rate is due to net change in unemployment ($IN - OUT$) and which is due to the changes in labour force (LF). The term ($IN - OUT$) can further be decomposed to separate the *contributions* of gross flows “in” and “out” of unemployment to changes in the unemployment rate:

$$\Delta \left(\frac{U}{LF} \right) = \underbrace{\frac{(E_{t-1} \rightarrow U_t) + (I_{t-1} \rightarrow U_t)}{LF_t}}_{IN} - \underbrace{\frac{(U_{t-1} \rightarrow E_t) + (U_{t-1} \rightarrow I_t)}{LF_t}}_{OUT} + \underbrace{U_{t-1} \left(\frac{1}{LF_t} - \frac{1}{LF_{t-1}} \right)}_{LF}. \quad (3)$$

If $(IN - OUT) = 0$, the number of unemployed remains constant over time. Then the observed changes in unemployment rate are to be attributed solely to a changing labour force.⁴ Conversely, under constant labour force, unemployment rate changes would be driven solely by net changes in unemployment.⁵ Table 4 in Section 5 indicates the contributions of the above defined components to unemployment rate dynamics.

2.3 The Calculation of Flow Transition Rates

The method of deriving the average month-to-month transition probabilities (flow rates) can be deduced from Tables 1.1.A–1.8.A in Appendix. In each table we divide the number of people involved in a given average monthly gross flow by the corresponding row total. For instance:

$$\lambda^{UE} = \frac{(U_{t-1} \rightarrow E_t)}{(U_{t-1} \rightarrow E_t) + (U_{t-1} \rightarrow U_t) + (U_{t-1} \rightarrow I_t)} = \frac{(U_{t-1} \rightarrow E_t)}{U_{t-1}} \quad (4.1)$$

shows in per cent the probability to exit unemployment and become employed.⁶ Transition rates form a 3x3 matrix (4.2), where the diagonal terms represent unchanged labour market statuses:

Status in previous period ($t - 1$)	Status in current period (t)			Total
	E_t	U_t	I_t	
E_{t-1}	λ^{EE}	λ^{EU}	λ^{EI}	1
U_{t-1}	λ^{UE}	λ^{UU}	λ^{UI}	1
I_{t-1}	λ^{IE}	λ^{IU}	λ^{II}	1

(4.2)

⁴ A negative sign of the third term on the RHS of formula (3) thus indicates a decline in percentage points in the unemployment rate due to increasing labour force. Contribution of changes in labour force to changes in the observed unemployment rate can also be decomposed, to separate contributions of the respective gross flows that shape the evolution of the labour force (for detail, see Dixon *et al.* 2011). For the sake of simplicity we limit our analysis to decompositions expressed in our formula (3).

⁵ Formula (3) is based, with certain modifications, on Dixon *et al.* (2011). A more common practice is to follow Shimer (2007); or Petrongolo and Pissarides (2008), to show how much of the variance of the *steady state* unemployment rate accounts for changes in the flow transition rates. Elsby *et al.* (2011); or Baranowska-Rataj and Magda (2013) use this approach for analysing the youth unemployment rate dynamics. Following this research direction is beyond the scope of the present paper. Instead, we limit ourselves on decompositions of the *observed* changes in unemployment rates, in line with the above described methodology.

⁶ In case of Czech young unemployed in 2007–2008, λ^{UE} is obtained from Table 1.5.A in Appendix as follows: $[4,073:(4,073+56,916+519)].100 = 6.62\%$. This figure is then reported in Table 3.2.A in Appendix.

Each row also involves two off-diagonal terms indicating the transitional probabilities. In a fully tight labour market, the off-diagonal terms equal zero. Conversely, in a totally fluid labour market with 100 per cent transitions of individuals between the statuses, the diagonal terms equal zero. These properties make the flow transition rates a useful tool for comparisons of labour market tightness/fluidity across countries, age groups and periods of time. We provide such comparisons in Tables 2.1.A–3.12.A in Appendix. Nonetheless, caution is necessary in interpreting the results and comparing them with gross flow analysis outlined earlier. Note that any gross flow can be expressed as a product of a given transitional probability and previous labour market stock; e.g., $(U_{t-1} \rightarrow E_t) = \lambda^{UE} \cdot U_{t-1}$. It follows that the identical values of various flow transition rates could conceal very different quantities of people involved in a given transition.

Note also that the number of unemployed is typically much lower than the number of employed. Equality of flow transition rates $\lambda^{EU} = \lambda^{UE}$ then represents a rather dramatic increase in the number of unemployed, contrary to the balanced flows between employment and unemployment that one might misleadingly assume. Analogously, the same value of e.g., λ^{UE} recorded for different periods, countries or age categories could again represent very different numbers of people. To avoid such *stock-flow fallacy*, we interpret the flow transition rates strictly as average *individual* prospects to change the previous labour market status in the current month. Only in this relatively narrow sense these rates are comparable across countries, age groups and periods of time.⁷

This also means that the values of flow transition rates alone are insufficient for concluding on the actual evolutions of labour market *aggregates* such as net changes in the number of unemployed or the unemployment rate. Moreover, the flow transition rates assign the same probability of changing/retaining the previous labour market status to each individual, irrespective of the duration of her/his previous status and other characteristics. Figures 1 and 2 in Section 6 address the two inflow rates into unemployment, while the next two figures map the developments in outflow rates from unemployment. Figures 5–6 focus on flow transition rates between employment and inactivity.

2.4 Estimating the Impact of Unemployment Duration

Some studies on duration dependence apply a probit regression model. Albert *et al.* (2008) follow this direction when analysing school-to-work transitions in Spain. The probit model has among others been also used by Kelly *et al.* (2013), who analyse youth transitions from unemployment into employment in Ireland. However, as we intend to utilise fully the longitudinal structure of our data (for detailed description see Section 3) we consider unemployment as a time-related process. This is why, in our case, a duration model is likely to be more appropriate. This is in line with e.g. Albert *et al.* (2008), who initially provide probit regression estimates but subsequently turn to a duration model as better way to capture the time-related process. Other examples of applying duration models include analysis of unemployment durations of young people in France (D’Addio, 1998); retirement decisions in Britain (Disney *et al.*, 2006); labour mobility in Latvia (Brauksa and Fadejeva, 2013); or employment decisions after the birth of the first child in Spain (Davia and Legazpe, 2014).

The Kaplan-Meier estimator (Kaplan and Meier, 1958) serves as a preliminary step preceding the estimation of a duration model. It represents a non-parametric estimate of the survival

⁷ To illustrate this point: Table 2.6.A in Appendix reports $\lambda^{UE} = 4.77\%$ for unemployed Spanish young women in 2009–2010. In other words, for every 100 previously unemployed young women in Spain, on average 4.77 are employed in current month. Table 2.4.A in Appendix reports $\lambda^{UE} = 5.53\%$ for unemployed prime-age women in Spain for the same period, thus evidencing their relatively better individual chances to find job.

function $S(t)$ that captures the probability of survival past time t . In our analysis, “survival” means the period of time when an individual remains unemployed; time t is measured in months. Kaplan-Meier estimate of the survival function at any time t is:

$$\hat{S}(t) = \prod_{j|j \leq t} \frac{n_j - d_j}{n_j}, \quad (5)$$

where n_j is the number of unemployment spells lasting at least j months, and d_j is the number of such spells transitioning into employment immediately after j months. Using STATA commands and routines, we evaluate point estimates and 95% confidence interval estimates of $S(t)$ for both age groups in countries and periods of our interest. We apply log-rank tests for equality of survival functions. The results are presented in Figure 7 in Section 7. The estimated survival function (5) could be transformed into a hazard function, defined as d_j/n_j at any time t (see Figure 4.1.A in Appendix). This function can be treated as a preliminary estimate of baseline hazard function in duration model but without any explanatory variables. Subsequently, it is further developed and controlled for a set of additional characteristics.

In duration model estimations we build up on a discrete-time proportional hazard model introduced by Cox (1972), and further developed by Prentice and Gloeckler (1978). Meyer (1990) adapted this model to control for unobserved heterogeneity, while Jenkins (1997) implemented it into a STATA routine `pmghaz`. We use a refined version (`pmghaz8`) authorised by Stephen Jenkins and applied by, e.g., Disney *et al.* (2006); Albert *et al.* (2008); or Davia and Legazpe (2014). Hazard models use the concept of a hazard rate $\lambda(t)$. In our case, the hazard rate represents the instantaneous probability of exiting unemployment and moving into employment at time t conditional to having remained unemployed till the moment immediately before t . General definition of continuous hazard rate is:

$$\lambda(t) = \lim_{\Delta t \rightarrow 0} \frac{\Pr(t \leq T < t + \Delta t \mid T \geq t)}{\Delta t}, \quad (6)$$

where T is the duration of a spell (here the number of months over which a randomly chosen individual remains unemployed).⁸ Proportional hazard model assumes that continuous hazard rate for i^{th} spell bears the following form:

$$\lambda_i(t) = \lambda_0(t) \cdot e^{X_i'(t) \cdot \beta}. \quad (7)$$

In equation (7), $\lambda_0(t)$ stands for the so called baseline hazard. $X_i(t)$ is a vector of covariates (explanatory variables), such as age of the individual, gender, level of education, *etc.* β denotes a vector of parameters to be estimated. Finally, the term $e^{X_i'(t) \cdot \beta}$ represents a proportional shifter – the observed explanatory variables shift the entire hazard rate up or down. Note that covariates $X_i(t)$ may generally depend on time. In our analysis all covariates are treated as time-invariant, so we can simplify the notation and write X_i instead of $X_i(t)$. As our data are grouped by months, we have to use a discrete-time model. Generally, if duration data are grouped into p intervals with the j^{th} interval defined as $[a_{j-1}, a_j]$, the hazard function in the j^{th} interval would represent the conditional probability of leaving unemployment and moving into employment within the interval $[a_{j-1}, a_j]$, given that the duration of the unemployment spell is at least a_{j-1} . In mathematical terms:

⁸ It can be derived that $\lambda(t) = \frac{f(t)}{S(t)}$, where $f(t)$ is the probability density function of T , and $S(t)$ is the survival function.

$$h_j(X_i) = \Pr(a_{j-1} \leq T < a_j \mid T \geq a_{j-1}). \quad (8)$$

When applying previous assumptions and notation, the model we use bears the following general form:

$$h_j(X_i) = 1 - e^{-e^{(X_i' \beta + \gamma_j)}}, \quad (9)$$

where, for each duration interval, the parameter γ_j represents natural logarithm of the baseline hazard over the relevant interval. In our analysis we use five different duration intervals: $j = 1$ represents first two months of unemployment spell; $j = 2$ denotes a spell lasting 3–4 months; $j = 3$ stands for spells of 5–6 months; $j = 4$ for spells between 7 and 12 months; and finally $j = 5$ represents spells of 13–24 months. The vector of covariates X_i consists of an age variable defined in years; a household size variable defined as the number of household members; a dummy variable for male; two dummies for the highest attained levels of education (secondary and tertiary); and two dummies for densely and medium-populated place of residence. STATA routine `pmghaz8` provides log likelihood estimates of all coefficients of the model and confidence interval estimates.

For the sake of better interpretation, the coefficients are transformed into hazard ratios. Estimation results presented in Table 6 in Section 7 thus mean e^β rather than β (standard errors and confidence intervals are also transformed): Suppose for instance that the hazard ratio reported for males takes the value “2”. This would indicate a higher “hazard” of transitioning from unemployment into employment for men than for women. More precisely, the probability that a man moves in a randomly chosen time from unemployment into employment would be, *ceteris paribus*, twice as high as for a woman.

The model described so far assumes that the set of covariates can capture all the existing individual differences. Such assumption might be too far-fetched in practice because of the presence of unobserved differences between the individuals; so it is advisable to control for unobserved heterogeneity. The routine `pmghaz8` uses the mixed proportional hazard model where the continuous hazard rate is assumed to have the form:

$$\lambda_i(t) = \lambda_0(t) \cdot \varepsilon_i \cdot e^{X_i'(t) \cdot \beta} = \lambda_0(t) \cdot e^{X_i'(t) \cdot \beta + \ln \varepsilon_i}, \quad (10)$$

where ε_i is a gamma-distributed random variable with unit mean and unknown variance which has to be estimated (Stewart, 1996; Jenkins, 1997). Likelihood ratio tests suggest that unobserved heterogeneity is insignificant in all estimated models except for Spanish youth in 2007–2008. In this particular case, once controlled for unobserved heterogeneity, the hazard ratios of duration intervals became smaller and insignificant. In all remaining cases, the results are almost identical, regardless of controlling or not for unobserved heterogeneity. Thus Table 6 in Section 7 displays as a rule only the results *without* controlling for unobserved heterogeneity. Just for Spanish youth in 2007–2008, the results *with* controlling for unobserved heterogeneity are added.

3. The Data

EU-SILC is an annual survey with retrospectively stated monthly economic activity in the previous calendar year. It is harmonized by Eurostat and its longitudinal version is designed as a four-year rotational panel. The longitudinal character of the survey makes it possible to identify each respondent’s labour market status and its changes on monthly basis. In addition, the survey contains a set of additional variables relevant for our purposes, such as age, gender

and education, as well as information on family size, degree of urbanisation, etc. Monthly information on labour market status can potentially minimize the time aggregation bias which is inherently present in longitudinal analyses, e.g. European Union Labour Force Survey (EU-LFS) with its quarterly structure of information. Another advantage of longitudinal EU-SILC is the possibility of conducting international comparative analyses of labour market flows and related research. The use of longitudinal EU-LFS for international comparative analyses still remains considerably limited since it is not routinely available for research purposes.⁹

As a result, the use of longitudinal EU-SILC appears to be the only practically accessible way of how to conduct our analysis, in spite of its potential drawbacks, the retrospective nature of reported economic activity and its self-declared character among others.¹⁰ This may create the well-known calendar bias in the data and also lead to departure from the ILO definition of unemployment. In addition, the structure of the survey makes it impossible to analyse direct job-to-job flows of respondents.

The natural option would be to make use of the most recent full four-year panel of EU-SILC 2011 and thus fully exploit the longitudinal element of EU-SILC. For a period 1/2007–12/2010 it provides a chain of 47 monthly individual comparisons of the previous and current labour market statuses. However, we are particularly interested in a group of young individuals, namely in those aged 16–24 at the beginning of the analysed period, which rules out the possibility to utilise the full four-year panel data due to its small number of respondents. Instead, we decided to extract two two-year periods from EU-SILC 2009, which covers monthly economic activity for 1/2007–12/2008, and EU-SILC 2011, which involves the period 1/2009–12/2010. Both of these subsamples provide chains of 23 monthly comparisons of individual labour market statuses and contain substantially more respondents than the full four-year panel.

As the reference group prime-age population aged between 25 and 54 at the beginning of both analysed periods was selected. Only those respondents of both age categories who fully participated in these two-year surveys have been subject of further analysis. Thus our subsamples for 2007–2008 and 2009–2010 can be viewed as pure two-year panels, where all the reported month-to-month individual labour market statuses are matched. Our pre-weighted matched subsamples eventually consisted of 1,757 and 1,560 young Czechs and 2,391 and 2,271 young Spanish for the respective periods. The other groups included 6,554 and 5,655 Czech, and 10,198 and 9,929 Spanish prime-aged workers. Afterwards we applied the longitudinal weights designed by Eurostat specifically for these two-year subsamples, the standard means of minimising the possible attrition bias. The sizes of these weighted matched subsamples can be seen in Tables 1.1.A–1.8.A in Appendix. EU-SILC data organised in the above described way were used for analysis in Sections 5 and 6.

In Section 7 the unit of analysis is an unemployment spell, compared to an individual in previous sections. This specificity leads to application of our pre-weighted samples which are further limited only to individuals who experienced unemployment during the observed periods (10–25% of individuals in the first period; 13–27% in the second period). Note however that an individual might experience more than one unemployment spell. Hence, each of her/his unemployment spells enters the analysis as a separate observation (so called *multiepisodes*).

⁹ ECB (2012) explores the EU LFS data for a flow analysis of working-age population as a whole and stress explicitly their limited availability/reliability.

¹⁰ Employment definition in EU-SILC includes employees and self-employed (including family workers) working part-time or full-time. Unemployment is self-defined according to person's own perception. Inactivity comprises students, further training, unpaid work experience, retirement and early retirement, permanently disabled, military service, fulfilling domestic tasks and care responsibilities, and other inactive persons. Pros and cons of using the longitudinal EU-SILC for labour market flow analysis are discussed in detail by Flek and Mysíková (2015).

For the sake of clarity, we continue to refer to respondents or individuals, but some of them might actually represent more than one observation.

The data used in Section 7 are naturally censored. We call a particular unemployment spell left-censored when it is already in progress at the beginning of the observed period. Unemployment spells which do not terminate by the end of the observed period result in right-censoring. An additional, specific type of right-censoring occurs when unemployment spell ends in inactivity rather than employment. These types of censoring cause certain difficulties which we face in our model estimations in Section 7. If we drop the censored observations, the mean unemployment duration would become downward-biased because longer unemployment spells are more likely to be censored than the short ones.

For this reason we keep all the censored observations in the dataset, yet, by doing so, we face in turn the problem that the actual length of an unemployment spell remains unknown for censored observations. This is why when building up the estimation models we introduce a censoring indicator which equals 1 if unemployment spell terminates by employment, and 0 in all other cases. The models applied are designed to consider the right-censored data while left-censoring remains generally unaddressed by estimation techniques available to us.

4. The Size and Structure of Gross Labour Market Flows

The bottom row in Table 1 reveals differences in the relative involvement of young and prime-age individuals in gross labour market flows. In general, however, their total involvement in these flows appears to be slightly lower than that which prevails on the US/UK labour markets. In the U.S. between 5%–7% of working-age individuals change on average their labour market status every month, depending on the analysed period and author. The quarterly results for the UK are similar to the U.S. (see, e.g., Gomes 2009 for an overview). This signals a rather lower degree of fluidity prevailing on Spanish/Czech labour markets.¹¹

Table 1: *Gross Labour Market Flows in Spain and the Czech Republic*

Flow share	ES				CZ			
	2007-2008		2009-2010		2007-2008		2009-2010	
	<i>youth</i>	<i>prime-age</i>	<i>youth</i>	<i>prime-age</i>	<i>youth</i>	<i>prime-age</i>	<i>youth</i>	<i>prime-age</i>
<i>EU</i>	0.96	0.86	0.77	0.93	0.18	0.25	0.31	0.35
<i>EI</i>	0.55	0.12	0.35	0.11	0.12	0.16	0.09	0.17
<i>UE</i>	0.80	0.67	0.68	0.85	0.36	0.36	0.45	0.38
<i>UI</i>	0.08	0.05	0.20	0.08	0.05	0.05	0.08	0.04
<i>IE</i>	0.93	0.12	0.51	0.11	0.53	0.18	0.27	0.18
<i>IU</i>	0.29	0.07	0.24	0.08	0.21	0.07	0.36	0.07
Total	3.61	1.89	2.75	2.16	1.45	1.07	1.56	1.19

Note: Monthly averages; in per cent of matched labour market stocks of young and prime-age individuals.

Source: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB2011, version 1 of August 2013. Own calculations from weighted matched samples.

¹¹ Our results do not involve the category of individuals aged 55+ at the beginning of the surveyed periods. Nonetheless, taking this age group into consideration would not change substantially the results of comparisons with the US/UK. Yet international comparisons of our results require caution. Apart from differences in, e.g., data collection and organisation, the results for the U.S. refer to averages derived from one or even two decades of monthly observations, while our data cover much shorter time spans. When we refer to the UK, one has to consider additionally the quarterly structure of the UK longitudinal data which might generate over/underestimated results due to possible time aggregation bias.

As noted above, Table 1 shows that young workers are relatively more often involved in labour market flows than their prime-age counterparts. This finding holds across the countries and periods analysed and confirms the observations of Elsby *et al.* (2011), who found out that young people indeed appear to “churn” through the labour markets relatively more frequently. However, Table 1 also documents that over time the relative involvement of young workers in gross flows in Spain appears to decline, while prime-age individuals evince the opposite tendency.

As a result of such disproportionate evolution and with the progressing Great Recession, the gap between labour market dynamics in both age groups was apparently narrowing in Spain. Thus the youth labour markets in this country have responded to the deepening Great Recession by losing part of their fluidity, while the prime-age labour markets have become slightly less tight. By contrast, the structure of youth and prime-age gross flows in the Czech Republic is much more stable.

The figures in Table 1 enable us also to categorise the relative importance of each of six gross flows for the entire labour market dynamics and to compare the results of the young and prime-age individuals. In line with expectations, labour market dynamics of prime-age individuals is concentrated predominantly in gross flows between employment and unemployment and *vice versa*. In contrast, the patterns of youth labour market dynamics are much more dispersed, with relatively higher gross flows into and from inactivity compared to prime-age individuals: The distinctive features of the youth and prime-age labour market dynamics are thus most remarkable when comparing the relative share of individuals involved in gross flows from inactivity to unemployment (*IU*) and from inactivity to employment (*IE*) of both age groups.

Although the above results reveal some age-based specifics of labour market dynamics, they alone cannot provide explicit answers about the key drivers of unemployment evolution within both age groups. The following section clarifies how gross flows shape the evolution of unemployment.

5. Gross Flows and Unemployment Dynamics

The following tables 2 and 3 evidence that the observed net changes in the number of unemployed result from the surprisingly high amount of people either entering or leaving the unemployment status. This finding is valid, albeit with different intensity, for all the countries, periods and age groups analysed. For instance, average monthly net increase in prime-age (youth) unemployment recorded for Spain in 2009–2010 is 17,264 (5,195) people. But there are 373,820 (81,355) individuals who move, on average, every month into or from unemployment (see the last column of Table 2). In more detail, every month unemployment is on average entered by 195,542 (43,275) workers and exited by 178,278 (38,080). Thus unemployment is in general much less stable phenomena than one would consider when looking solely at figures based on unemployment stocks.

Among other findings, the second column of Table 2 documents that in absolute numbers the major source of increasing youth unemployment in Spain is clearly the gross flow into unemployment from employment ($E_{t-1} \rightarrow U_t$). In direct contrast, in its third column Table 3 testifies that in the Czech Republic the increase in the number of young unemployed is mainly due to inflows of new labour market entrants into unemployment ($I_{t-1} \rightarrow U_t$). Thus, in addition to different youth unemployment figures in absolute numbers, there are also remarkable cross-country differences in the key drivers of increases in the total number of youth unemployment.

Table 2: Gross Labour Market Flows and Unemployment in Spain (in absolute numbers, monthly averages)

	Net change in Unemployment $\Delta U = IN - OUT$	Inflows into unemployment from employment ($E_{t-1} \rightarrow U_t$)	Inflows into unemployment from inactivity ($I_{t-1} \rightarrow U_t$)	IN	Outflows from unemployment into employment ($U_{t-1} \rightarrow E_t$)	Outflows from unemployment into inactivity ($U_{t-1} \rightarrow I_t$)	OUT	IN+OUT
2007–2008								
prime-age	39,324	162,967	12,402	175,369	126,902	9,143	136,045	311,414
youth	15,963	40,932	12,141	53,073	33,830	3,280	37,110	90,183
total	55,287	203,899	24,543	228,442	160,732	12,423	173,155	401,597
% of youth	28.90	20.10	49.50	23.20	21.05	26.50	21.40	22.40
2009–2010								
prime-age	17,264	179,286	16,256	195,542	162,856	15,422	178,278	373,820
youth	5,195	33,070	10,205	43,275	29,294	8,786	38,080	81,355
total	22,459	212,356	26,461	238,817	192,150	24,208	216,358	455,175
% of youth	23.10	15.60	38.60	18.10	15.20	36.30	17.60	17.90

Source of tables 2–3: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB 2011, version 1 of August 2013. Own calculations from weighted matched samples.

Table 3: Gross Labour Market Flows and Unemployment in the Czech Republic (in absolute numbers, monthly averages)

	Net change in unemployment $\Delta U = IN - OUT$	Inflows into unemployment from employment ($E_{t-1} \rightarrow U_t$)	Inflows into unemployment from inactivity ($I_{t-1} \rightarrow U_t$)	IN	Outflows from unemployment into employment ($U_{t-1} \rightarrow E_t$)	Outflows from unemployment into to inactivity ($U_{t-1} \rightarrow I_t$)	OUT	IN+OUT
2007–2008								
prime-age	-4,183	10,849	2,987	13,836	15,648	2,371	18,019	31,855
youth	-176	2,071	2,345	4416	4,073	519	4,592	9,008
Total	-4,359	12,920	5,332	18,252	19,721	2,890	22,611	40,863
% of youth	4.0	16.00	44.00	31.9	20.60	18.00	20.30	22.00
2009–2010								
prime-age	253	15,349	3,161	18,510	16,555	1,702	18,257	36,767
youth	1,643	3,554	4,155	7,709	5,172	894	6,066	13,775
total	1,896	18,903	7,316	26,219	21,727	2,596	24,323	50,542
% of youth	86.70	18.80	56.80	29.40	23.80	34.4	24.90	27.20

Furthermore, Table 3 suggests the presence of serious adverse tendencies on the Czech youth labour market. Such message still remains rather hidden behind the relatively favourable aggregate figures. Nonetheless, in 2009–2010, nearly 90 per cent of monthly unemployment increases displayed in Table 3 are to be attributed to Czech youth, compared to only 23 per cent in Spain. Viewed from this perspective, youth unemployment in the Czech Republic is a much more disproportionate phenomenon than in Spain.

The above presented analysis of net changes in the number of unemployed might be instructive in some respects, but what really matters is the link between the evolution of gross flows and changes in the unemployment rate. In its second column Table 4 documents the disproportionate developments in youth unemployment rates compared to evolutions in prime-age unemployment rates. This applies fully to Spain where the upward youth unemployment rate dynamics is higher for both 2007–2008 and 2009–2010.

In the Czech Republic, similar developments are apparent only in the second period analysed. In its other columns, Table 4 indicates the contributions to unemployment rate dynamics recorded for both age categories. In general, the “ins” and “outs” of unemployment account for virtually 100 per cent of changes in prime-age unemployment rates, with almost no contribution of changes in labour force. The structure of youth unemployment rate dynamics is different due to non-negligible contributions of changes in the youth labour force. Yet the “ins” and “outs” remain decisive for identifying the sources of different evolutions in the youth- and prime-age unemployment rates.

Let us illustrate this point in more detail by looking at the situation in Spain in 2007–2008. From Table 4 it can be concluded that in 2007–2008 the monthly youth unemployment rate in Spain grew on average more than twice as fast as the prime-age unemployment rate. What are the sources of this disproportionality? First, let us concentrate on the “ins” and “outs” of unemployment in Spain during that period. Such a view would provide a closer look at age-specific unemployment rate dynamics, net of changes in labour force. In this respect, the most striking difference concerns the gross flows into unemployment ($E_{t-1} \rightarrow U_t$; $I_{t-1} \rightarrow U_t$).

Table 4: *Changes in Unemployment Rates – Gross Flow Decomposition*
(monthly averages, in percentage points)

Period/ country	$\Delta\left(\frac{U}{LF}\right)$	Contribution of IN	$\frac{(E_{t-1} \rightarrow U_t)}{LF_{t+1}}$	$\frac{(I_{t-1} \rightarrow U_t)}{LF_{t+1}}$	Contribution of OUT	$\frac{(U_{t-1} \rightarrow E_t)}{LF_{t+1}}$	$\frac{(U_{t-1} \rightarrow I_t)}{LF_{t+1}}$	Contribution of changing LF
2007–08								
<i>ES</i>								
- youth	0.5598	2.6376	2.0342	0.6034	-1.8443	-1.6813	-0.1630	-0.2335
- p.a.	0.2262	1.0181	0.9461	0.0720	-0.7898	-0.7367	-0.0531	-0.0021
<i>CZ</i>								
- youth	-0.2994	1.1077	0.5194	0.5882	-1.1517	-1.0215	-0.1302	-0.2554
- p.a.	-0.1131	0.3672	0.2879	0.0793	-0.4782	-0.4153	-0.0629	-0.0020
2009–10								
<i>ES</i>								
- youth	0.1230	2.5633	1.9588	0.6045	-2.2556	-1.7352	-0.5204	-0.1847
- p.a.	0.1004	1.1302	1.0362	0.0940	-1.0304	-0.9413	-0.0891	0.0006
<i>CZ</i>								
-youth	0.0918	2.1236	0.9790	1.1446	-1.6710	-1.4248	-0.2463	-0.3608
-p.a.	0.0025	0.4855	0.4026	0.0829	-0.4788	-0.4342	-0.0446	-0.0042

Source: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB 2011, version 1 of August 2013. Own calculations from weighted matched samples.

For young individuals in Spain in 2007–2008, the sum of these two “ins” accounts on average for 2.6 percentage points of increase in the monthly youth unemployment rate. The respective

contribution of the “ins” to increases in prime-age unemployment rate represents just one percentage point. The major part of this difference is concentrated in the gross flow from employment into unemployment ($E_{t-1} \rightarrow U_t$). The monthly youth unemployment rate was increasing on average by two percentage points due to this gross flow compared to less than one percentage point of increase in the prime-age unemployment rate.

When looking at the “outs” of youth unemployment in Spain in the same period ($U_{t-1} \rightarrow E_t$; $U_{t-1} \rightarrow E_t$), they accounted on average for a monthly youth unemployment rate decline of 1.8 percentage points. At the same time, the contribution of the “outs” to diminishing the prime-age unemployment rate was one percentage point lower. Nevertheless, the total balance of “ins” and “outs” remained highly unfavourable for Spanish youth. When taking into account the changes in youth labour force in Spain over 2007–2008, the overall picture does not change dramatically. Although the increases in youth labour force diminished their monthly average unemployment rate by some 0.23 percentage points, this was clearly not enough to offset the adverse balance between the “ins” and “outs” of youth unemployment. The patterns of unemployment dynamics in Spain did in principle not change in 2009–2010 either, although the increases in youth and prime-age unemployment rates converged remarkably.

At first glance, compared to Spain the situation of young people on the Czech labour market looks almost idyllic. However, the period 2009–2010 was in fact marked with strong relative deterioration in youth unemployment in the Czech Republic. While, on average, the monthly prime-age unemployment rate stagnated during that period, the youth unemployment rate was increasing every month on average by some 0.1 percentage point. As mentioned above, if we consider the youth and prime-age individuals together, Czech young people accounted for about 90 per cent of net increases in the number of unemployed in 2009–2010. As with Spain, the major adverse factor influencing the disproportionate upward dynamics of the youth unemployment rate were the “ins”. Specifically, the gross flows into unemployment constituted more than two percentage points of average monthly increases in the youth unemployment rate, compared to less than a half percentage point for prime-age individuals. Structural similarities with Spain can also be seen in contributions of the “outs” to the youth unemployment rate dynamics. The same applies to the role of increasing the youth labour force.

Yet, one key structural difference with Spain exists concerning the way the two “ins” contribute to increases in the youth unemployment rate. In the Czech Republic, the gross flow from inactivity into unemployment ($I_{t-1} \rightarrow U_t$) accounted for the majority of increases in the youth unemployment rate. In contrast, in Spain the main driver of youth unemployment rate increases was the gross flow from employment into unemployment ($E_{t-1} \rightarrow U_t$). Our results thus signal that the amount of Czech young people who face the difficulty to find a job at the moment of entering the labour market is likely to be the most important factor behind the observed increases in the youth unemployment rate. In Spain, however, the key problem appears to be in the relatively high amount of young workers who are exposed to job losses. Thus the employment policy agenda in both countries should be aimed at reducing/expanding the different types of gross flows to prevent further accelerations in youth unemployment rates.

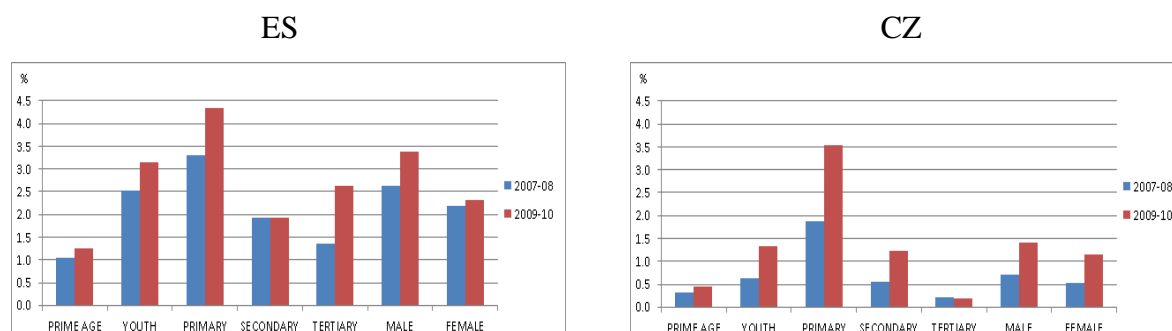
6. Comparative Analysis of Flow Transition Rates

The following Figure 1 manifests that an individual’s exposure to a risk of job loss is remarkably lower in the Czech Republic than in Spain, a finding which holds true for both periods and in all age-, educational- and gender breakdowns. At the same time, in both countries, it confirms the presence of age-specific inequality in individual’s exposure to the risk of job loss (see the columns PRIME AGE and YOUTH). Namely, the job loss rates λ^{EU} are persistently higher for young workers with this gap further widening in the course of Great

Recession. This represents a common message for employment policies in both countries in a sense that the existing jobs held by young workers should be more supported/protected.

Educational and gender breakdowns of young workers in the other columns of Figure 1 suggest that particularly young people with primary education and young males are strongly affected by this risk and its further acceleration. However, the developments among the most educated young employees in Spain deserve attention, since their exposure to job loss risk has doubled. In contrast, young university graduates in the Czech Republic still enjoy a relative job security.

Figure 1: Job loss rates λ^{EU} in Spain and the Czech Republic (in percent; average month-to-month individual's probability of losing their job and becoming unemployed)



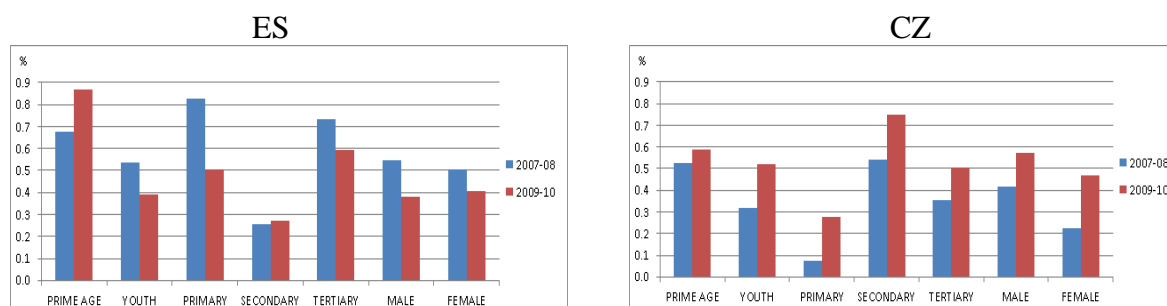
Source: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB 2011, version 1 of August 2013. Own calculations from weighted matched samples.

Note: In their first two columns, Figures 1–6 involve the comparisons of flow transition rates recorded for prime-age and young individuals. The remaining columns show the flow transition rates of youths in educational and gender breakdowns. Analogous decompositions of flow transition rates for prime-age individuals are reported in Tables 2.1.A–3.12.A in Appendix

According to Figure 2, an increasing exposure to unemployment risk affects the young Czech labour market entrants of all education and gender breakdowns, while in Spain the opposite tendency is apparent. Despite different country-specific developments, youths in both countries still remain relatively less affected by this type of risk in comparison with prime-age individuals. Furthermore, in 2009–2010 young people entering the labour market in Spain face a lower risk of becoming unemployed ($\lambda^{IU} = 0.40\%$) compared to youths in the Czech Republic ($\lambda^{IU} = 0.50\%$).

A comparison with Figure 6 provides another rather surprising result, namely, in 2009–2010, a young labour market entrant in Spain still had a higher average month-to-month probability of finding a job ($\lambda^{IE} = 0.80\%$) than becoming unemployed ($\lambda^{IU} = 0.40\%$). In the Czech Republic, the young people entering the labour market are confronted with quite opposite situation, where unemployment is the more likely destiny. It follows that the difficulty to (re)enter the labour market is probably not the major problem faced by countries with enormously high youth unemployment.

Figure 2: *Inflow rates λ^{IU} in Spain and the Czech Republic (in percent; average month-to-month individual's probability of entering unemployment from inactivity)*



Source: See Figure 1.

Figure 3 indicates that, in both countries, the prospect of finding a job was initially higher among young unemployed compared to prime-age unemployed. Moreover, and perhaps surprisingly, in 2007–2008 in Spain the young unemployed were more likely to find a job ($\lambda^{UE} = 9.05\%$) than their Czech counterparts ($\lambda^{UE} = 6.60\%$). In the second analysed period, however, this flow transition rate in Spain has deteriorated heavily and as a result, their individual prospects to find a job have eventually become worse in comparison not only with prime-age unemployed in Spain but also with young unemployed in the Czech Republic. Adverse developments in job finding rates recorded for young unemployed people in Spain are among the most remarkable signs of youth labour market deterioration in the country.

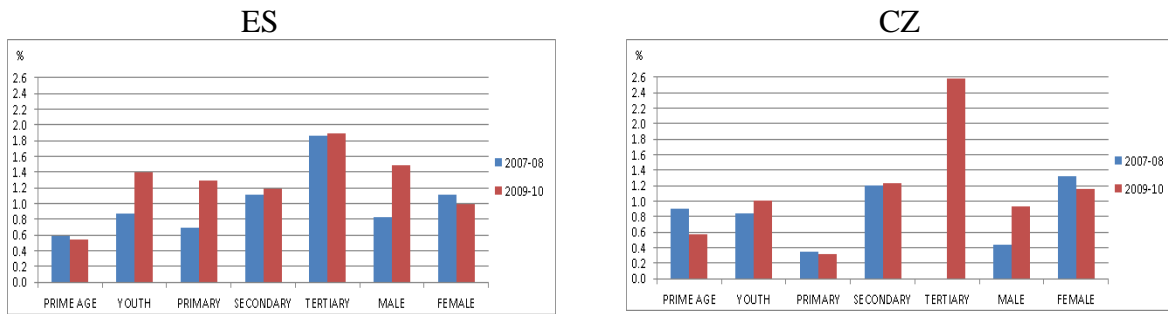
Figure 3: *Job finding rates λ^{UE} in Spain and the Czech Republic (in per cent; average month-to-month individual's probability of exiting unemployment and becoming employed)*



Source: See Figure 1.

According to Figure 4, in 2009–2010 young unemployed in both countries face relatively higher prospects to leave unemployment and move into inactivity than their prime-age counterparts. Another common feature is the rapid acceleration in this transition probability among the young men (from 0.80 to 1.50 per cent in Spain, from 0.45 to 0.95 per cent respectively in the Czech Republic). Young women evince the opposite tendency, as their individual prospects to leave unemployment and move into inactivity actually diminished. In other aspects the developments are rather country-specific. In Spain, young unemployed with primary education face rapid increases in their prospects to move into inactivity, while in the Czech Republic this tendency is gaining in relevance for unemployed university graduates. When interpreting these results, one has to note that unemployed workers in both countries are still much more likely to exit unemployment *via* employment (λ^{UE}) than *via* inactivity (λ^{UI}). The former probability is approximately 4–10 times higher depending on the country, period, age group and education level analysed (see also Tables 2.1.A–3.12.A in Appendix for detail).

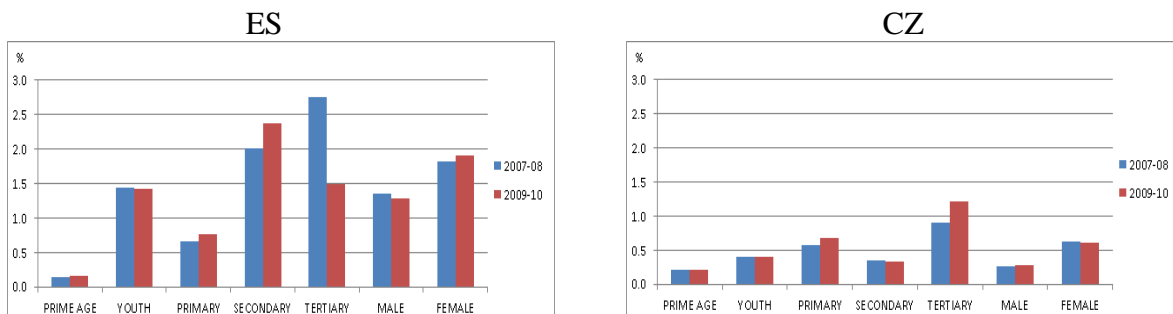
Figure 4: Outflow rates λ^{UI} in Spain and the Czech Republic (in percent; average month-to-month individual's probability of exiting unemployment and becoming inactive)



Source: See Figure 1.

Figure 5 confirms young workers' higher frequency of transitions from employment into inactivity compared to prime-age ones. It is not surprising that young women in both countries show higher flow transition rates λ^{EI} than young men. In addition, we see that in the second analysed period the usual motivations behind youth transitions from employment to inactivity, such as childhood care or attempts to upgrade current education, still remain at their previous levels or even strengthened. One important exemption from this tendency concerns university graduates in Spain: their flow transition rate λ^{EI} declined quite remarkably between 2007–2008 and 2009–2010, namely from 2.75 to 1.50 per cent. From this it can be deduced that insecure prospects of smooth re-entry into the labour market discourage the young university graduates in Spain from withdrawing. No similar tendency can be found among the remaining education or even gender groups in Spain and it is totally absent in the Czech Republic.

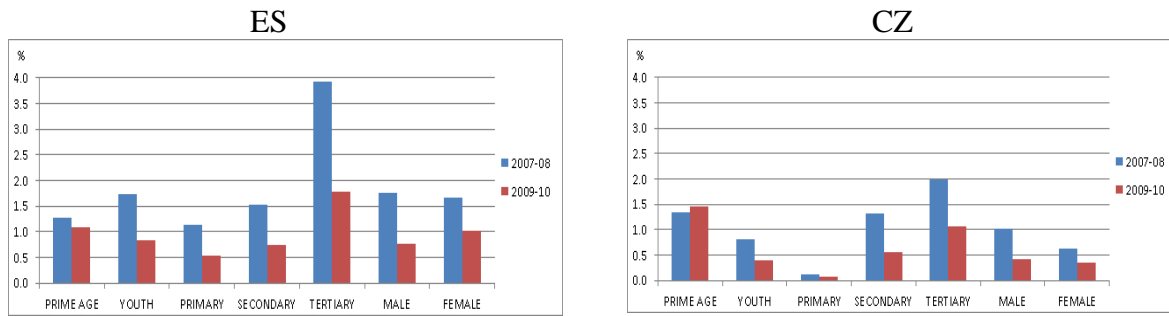
Figure 5: Flow transition rate λ^{EI} in Spain and the Czech Republic (in percent; average month-to-month individual's probability of exiting employment and moving into inactivity)



Source: See Figure 1.

Figure 6 involves transition probabilities λ^{IE} , i.e. the average chance of an inactive individual of moving into employment in the current month. In Spain in the first period of our analysis, this probability was higher for young people. This was in contrast with the Czech Republic, where even in the first period young labour market entrants faced relatively higher difficulties to find a job compared to prime-age individuals. But already in 2009–2010 we see that in both countries labour market entries of young people *via* employment have become relatively more limited compared to prime-age individuals. Even so, in Spain the transition probability of an inactive young individual to find a job still remains higher (0.85 per cent) compared to the Czech Republic (0.40 per cent). This actually leaves a young Czech labour market entrant with a striking one-in-two chance of receiving a job compared to young people in Spain.

Figure 6: Flow transition rates λ^{IE} in Spain and the Czech Republic (in percent; average month-to-month individual's probability of entering employment from inactivity)



Source: See Figure 1.

Although the prospects of young university graduates entering the labour market of finding a job have deteriorated heavily in both countries, in Spain their probability λ^{IE} in 2009–2010 still represents 1.80 per cent compared to a mere one per cent in the Czech Republic (Figure 6). These results generally signal that the deteriorated transitions of young people from schools (or maternity leave) to jobs are not necessarily the most pronounced problem faced by countries with high youth unemployment. This obviously holds true only in relative terms within a given comparative analytical perspective.¹²

The above presented findings appear to be mostly in line with results reported by Elsby *et al.* (2011) for the UK. Despite different structure of data and much longer period of analysis, they also conclude that young workers were experiencing remarkably higher job loss rates compared to older workers. However, our results differ partly with respect to the outflows from unemployment. According to Elsby *et al.* (2011), the job finding rates of young people were over a longer run also higher than those of older workers. Our results fully confirm this tendency in the Czech Republic, while in Spain it can be observed only in the first analysed period.

7. Unemployment and Duration Dependence

7.1 The Results of Survival Functions Estimates

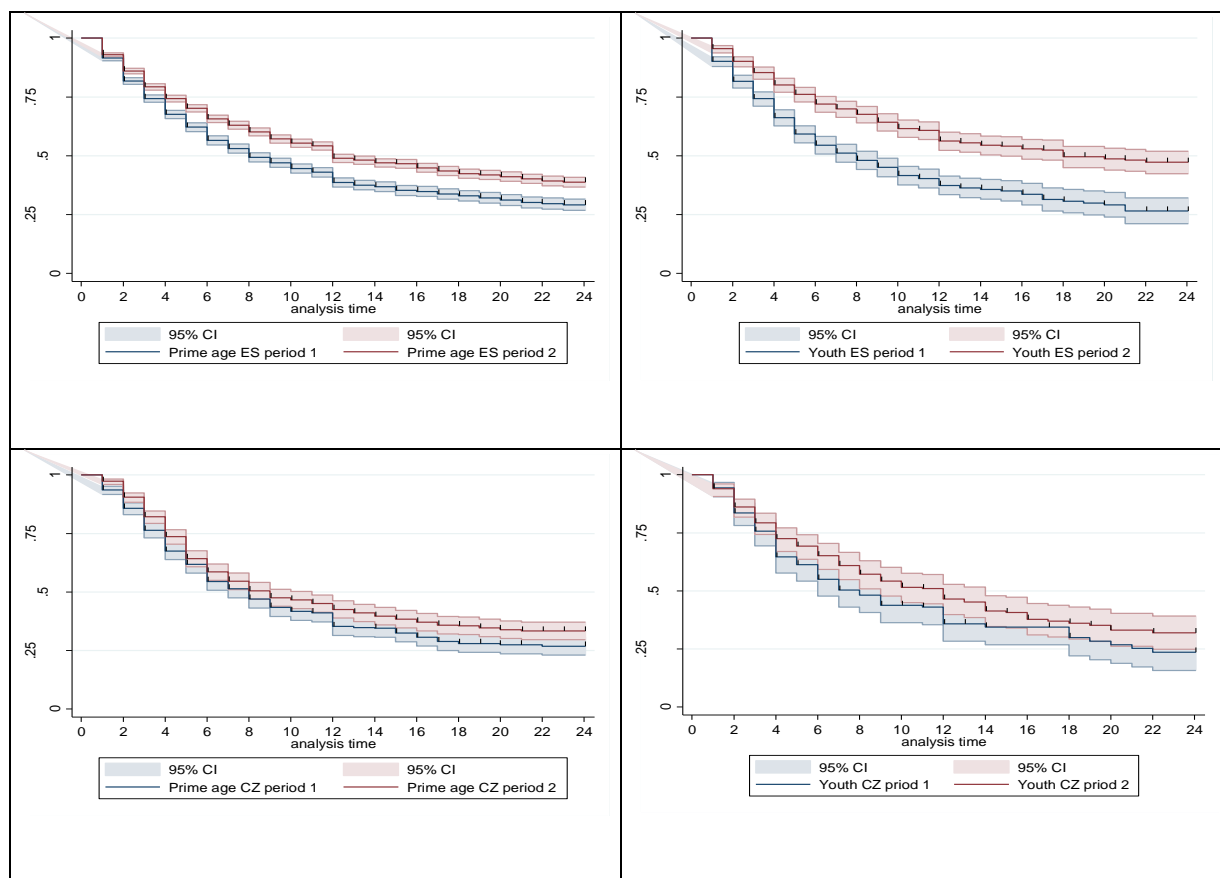
The following Figure 7 involves a set of diagrams with Kaplan-Meier survival functions. The horizontal axes depict the observed lengths of unemployment spells in months (t), while the vertical axes represent the shares of open spells after t months. All survival curves start from point “1”, meaning that all unemployment spells are open at $t = 0$. The slopes are declining over time, in line with the emergence of closed spells.

The survival function is an estimate which reflects the right-censoring discussed in Section 3. Specifically, one part of right-censored observations is actually distributed above the survival curve and another one below the curve. Yet, for the sake of clarity, we interpret the points at each survival curve as the fraction of those who were unemployed at time $t = 0$ and still have failed to find job till time t . Alternatively, we indicate how many months of unemployment duration are needed for a given fraction of unemployed to find job. By doing so we are aware of the fact that our results do not reflect only the values directly observed in the data but also the estimates for right-censored observations.

¹² Among other limitations, our results presented in Figure 6 do not say anything about how stable or satisfactory are the jobs held by young labour market entrants in Spain. See, e.g., Albert *et al.* (2008) for more discussion on this issue. In addition, relatively high job loss rates and their further increases among the young workers in Spain indeed suggest the presence of relatively high job instability.

Figure 7: *Probabilities of remaining unemployed over time*

(Kaplan-Meier survival function estimates for prime-age and young individuals in Spain and the Czech Republic; period 1: 2007–2008; period 2: 2009–2010)



Source: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB 2011, version 1 of August 2013. Authors' computations.

Note: Analysis time stands for lengths of unemployment spells in months. Log-rank tests reject the null hypothesis of equality of survival functions for the two periods in each diagram.

In all diagrams in Figure 7, the survival functions for 2009–2010 are placed above the functions for 2007–2008. This can be interpreted as indication of longer unemployment spells (or of a longer time of job search needed to exit from unemployment) in the peaking period of the Great Recession. To illustrate this point, let's look at the following example: In 2007–2008, 35(45) per cent of young unemployed in the Czech Republic managed to find job after an unemployment spell lasting for four (six) months. In the period 2009–2010, the number of months necessary to achieve the same rate of exits of Czech young individuals from unemployment to employment increased to 6 (9) months. The right upper diagram shows that in this respect the young unemployed in Spain were far worse off: In 2007–2008, 45 per cent of young unemployed in Spain succeeded to find job after an unemployment spell of six months. But in the period 2009–2010, the number of months required to reach the same rate of exits from unemployment to employment increased to 14 months.

The two upper diagrams suggest the presence of disproportionate increases in long-term unemployment of young people in Spain compared to their prime-age counterparts. Note for instance that the share of young people whose unemployment spells lasted at least for 12 months accelerated dramatically in Spain, namely from 37 per cent in 2007–2008 to 56 per cent in 2009–2010. At the same time, the share of Spanish prime-age unemployed with unemployment

spells lasting at least 12 months increased from 39 to 49 per cent. While it started in 2007–2008 at more or less comparable figures with prime-age unemployed, the situation of young long-term unemployed in Spain has worsened relatively more dramatically.

The two bottom diagrams suggest that the Czech Republic was also suffering from a relatively high and disproportionally developing long-term unemployment of young people. The share of young unemployed with unemployment spells lasting at least 12 months jumped from 36 per cent in 2007–2008 to 46 per cent in 2009–2010, while the same figure for prime-age unemployed rose from 35 to 43 per cent. In both countries it is thus likely that the proportion of young long-term unemployed was increasing more rapidly and eventually overtook the prime-age workers.

Table 5: *Mean and median survival time*

	Spain				Czech Republic			
	Youth		Prime-age		Youth		Prime-age	
period	2007-2008	2009-2010	2007-2008	2009-2010	2007-2008	2009-2010	2007-2008	2009-2010
Arithmetic mean – completed U spells	4.7 (3.8)	6.2 (4.5)	5.1 (4.1)	6.0 (4.8)	5.4 (4.6)	6.1 (4.9)	5.7 (4.3)	6.0 (4.2)
Arithmetic mean – all U spells	6.5 (5.5)	10.0 (7.0)	7.4 (6.2)	9.7 (7.3)	7.0 (6.2)	8.3 (6.9)	8.2 (7.2)	9.1 (7.5)
Kaplan-Meier Restricted mean	11.3 (0.38)	15.4 (0.36)	11.7 (0.19)	13.8 (0.17)	11.3 (0.67)	12.9 (0.58)	11.3 (0.35)	12.5 (0.34)
Kaplan-Meier Extended mean	16.1	30.5	17.4	23.6	15.2	19.6	16.1	19.8
Kaplan-Meier Median survival time	8 (0.56)	18 (-)	8 (0.33)	12 (0.51)	8 (0.99)	12 (1.26)	8 (0.43)	9 (0.70)

Source: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB 2011, version 1 of August 2013. Authors' computations.

Note: Standard deviations or standard errors in parentheses.

The prolonged lengths of mean and median unemployment spells between 2007–2008 and 2009–2010 for both countries and age groups are documented in detail in Table 5. The first row reports arithmetic means of completed (closed) unemployment spells only. When comparing both periods of interest we see a uniform tendency of increasing the mean lengths of unemployment spells in both countries and age groups analysed. Results in the remaining rows tell us in principle the same story, but the figures are much higher compared to those in the first row. This is in line with assumption that longer unemployment spells are more likely to be censored, and hence, analysing only completed unemployment spells would strongly underestimate the population mean.¹³ The disproportions in mean unemployment spells (however we define it) between the prime-age and young unemployed are apparent especially in 2009–2010 when the mean youth unemployment spells were in general longer. This finding holds with full uniformity for Spain while for the Czech Republic the results are rather mixed, depending on the mean indicator chosen.

The samples of unemployment spells are usually skewed. Therefore, as an indicator of central location, the median is more appropriate indicator than the mean. The median survival time is

¹³ Indeed, the arithmetic mean of all unemployment spells is much higher in all cases. However, even this indicator still underestimates the population mean, as it considers only a fraction of the actual length of incomplete unemployment spells. The restricted mean survival time is estimated as the area under the Kaplan-Meier survival curve. It also underestimates the population mean, as the survival function is limited to 24 months in our data. The extended mean is based on an exponential imputation of the right tail of Kaplan-Meier survival function so that the survival function curve eventually reaches zero.

computed as the shortest unemployment spell for which the survival function equals or is less than 0.5. Measured in integer months, in 2007–2008 the median was eight months for both countries and age groups of our interest. When looking at period 2009–2010, the median values rose for both age groups of unemployed more considerably in Spain than in the Czech Republic. Viewed from another perspective, the median unemployment spells in 2009–2010 were clearly higher for young unemployed than for prime-age ones. In Spain this gap was much deeper.¹⁴

7.2 Estimation Results of Proportional Hazard Models

The first four rows in Table 6 below involve the duration intervals γ_{1-4} . The hazard ratios then indicate the probability at which each of these four unemployment spells terminate by employment, relative to a chance to find job within reference unemployment spell lasting 13–24 months. The remaining rows report the impact of explanatory variables on the probability of moving from unemployment to employment for any past unemployment spell.

As far as the young unemployed in Spain are concerned, the highest chance to find job arises within an unemployment spell lasting 3–4 months, while the unemployed of prime-age are most likely to become employed within the first two months of their unemployment episodes.¹⁵ In both analysed periods, young people in the Czech Republic experience the highest probability of transition from unemployment to employment between the third and fourth month of past unemployment spell.¹⁶ In other words, Czech young unemployed are twice as likely to become employed within unemployment episode lasting 3–4 months than if their unemployment spell lasted 13–24 months. For prime-age unemployed in the Czech Republic, the coefficients for all duration intervals γ_{1-4} are high and significant. Note however that the highest probability of Czech prime-age unemployed to find a job has actually shifted from duration interval γ_2 in 2007–2008 to γ_3 in 2009–2010.

The analysis does not confirm with full uniformity that unemployed men are more likely to find a job than unemployed women within any given length of unemployment spell. In Spain, such gender-specific patterns of transitions from unemployment to jobs can only be asserted among prime-age unemployed. In the Czech Republic, they apply only to young unemployed in 2008–2009 and prime-age unemployed in 2009–2010.

The hazard ratios indicating the positive impact of tertiary education on transitions from unemployment to employment are significant for both of the countries and periods as well as age groups analysed. Results in Table 6 suggest that, e.g., employment prospects of young unemployed university graduates to find job are *ceteris paribus* by 1.34–6.25 times higher than for young individuals with primary education. The positive effect fully applies to the unemployed with secondary education in the Czech Republic, too. In contrast, in Spain it is significant only for prime-age unemployed in 2007–2008.

¹⁴ Our figures established for median unemployment spells are higher than those reported by D’Addio (1998) for France at the beginning of the 1990s. This study recorded the median unemployment spells based on Kaplan-Meier estimator for roughly 5 months for young men and 7 months for young women. Brauksa and Fadejeva (2013) observed for the sample of all unemployed in Latvia the median unemployment spell lasting about 11 months in 2005–2008, with an increasing tendency recorded for more recent periods (12 months for 2008–2010, and more than 15 months for 2010–2011, respectively).

¹⁵ Note that, once controlled for unobserved heterogeneity (the results are shown in Table 7 in italics), the hazard ratios of duration intervals γ_{1-4} become smaller and insignificant for young unemployed in Spain in 2007–2008. It is possible that this can be interpreted in a way that employment prospects of young unemployed deteriorated so heavily in this period, with the effect that unemployment duration *per se* plays no significant role.

¹⁶ Our results for young unemployed differ from findings presented by D’Addio (1998), where the French young people had at the beginning of the 1990’s the highest chances to find job within first two months of unemployment.

The effect of age is not uniform. As shown in Table 6, age plays a significant but relatively modest negative role when we look at prime-age unemployed, in a sense that the older the unemployed person, the lower her/his chance to move into employment. And indeed, the existing evidence suggests that unemployed people who are approaching the retirement age are faced with lower chances to re-enter into employment.¹⁷ This is most likely due to skill obsolescence and deterioration in accumulated human capital which potential employers associate with this group of unemployed. In Spain, a significant impact of age has been noticed for the young unemployed in both analysed periods and in direct contrast to prime-age population, this impact is now slightly positive. This could be interpreted in a way that employers in Spain prefer to hire young unemployed with previous employment record and accumulation of some working experience/discipline.

Household size has a significant and slightly negative impact on entering employment in most cases except for prime-age unemployed in the Czech Republic. For the young unemployed in both countries this can be associated with the fact that other members (parents) of respondents' households contribute decisively to the household budget and the young unemployed therefore feel less pushed to search for a job. Interpretation of results for prime-age unemployed in Spain is less straightforward.

The last explanatory variable involved in our analysis is densely populated area. Perhaps surprisingly, in some cases the coefficients are significant and suggest that the more densely populated the living area, the lower the probability to exit from unemployment and enter into employment. Notwithstanding the general assumption that bigger cities provide more job opportunities and, hence, entering into employment should be easier,¹⁸ our results suggest, at least partially, the opposite.

This could be partly explained by the fact that the coefficients evaluate the significance of the area of residence and not of the actual workplace. In addition, one can assume that unemployed individuals living in bigger cities may have higher reservation wages as well as other requirements linked with the quality of potential job. These specificities may make them more reluctant to accept "second-rate" jobs compared to those unemployed living in less densely populated areas. However, verification of such assumptions would require further research.

¹⁷ See Flek and Mysíková (2015) for some supporting evidence with regard to the Czech Republic.

¹⁸ Such an effect was found, e.g., by Brauksa and Fadejeva (2013) for Latvia where the unemployed people living in the capital city have the highest probability to find job.

Table 6: *Hazard ratios of transition from unemployment to employment*
(not controlled for unobserved heterogeneity unless stated otherwise)

	Spain					Czech Republic			
	YOUTH			PRIME	AGE	YOUTH		PRIME	AGE
period	2007–2008	2007–2008 ^x	2009–2010	2007–2008	2009–2010	2007–2008	2009–2010	2007–2008	2009–2010
γ_1 (1.-2.month)	2.984***	1.080	3.123***	3.737***	3.613***	1.323	1.675*	2.714***	1.750***
γ_2 (3.-4.month)	3.124***	1.423	3.655***	3.571***	3.594***	2.064*	2.009**	4.391***	3.782***
γ_3 (5.-6.month)	3.070***	1.737	3.329***	3.410***	3.065***	1.416	1.272	3.882***	4.439***
γ_4 (7.-12.month)	2.063**	1.501	2.625***	2.444***	2.405***	1.541	1.428	2.759***	2.191***
Male	0.982	0.962	1.081	1.091*	1.102**	1.511**	0.784	1.100	1.355***
Tertiary education	1.748***	2.068***	1.338*	1.204***	1.294***	6.247***	2.471*	2.284***	2.905***
Secondary education	1.131	1.160	1.159	1.118*	1.032	3.086***	1.605**	1.719***	1.627***
Age	1.046*	1.079**	1.103***	0.989***	0.991***	0.983	1.026	0.984***	0.989**
Household size	0.893***	0.838***	0.917**	0.940***	0.932***	0.845**	0.869**	0.978	0.948
Densely populated area	0.914	0.916	0.574***	0.743***	0.703***	0.453***	0.517***	0.836	0.827
Medium-populated area	1.022	1.087	0.788	0.682***	0.782***	0.594**	0.628**	0.771**	0.884
Constant	0.019***	0.038***	0.003***	0.058***	0.040***	0.064**	0.042***	0.038***	0.029***
Log-Likelihood	-1442.1	-1439.98	-1252.1	-5631.36	-6862.55	-415.8	-571.9	-1581.8	-1669.25

Source: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB 2011, version 1 of August 2013. Authors' computations.

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; ^x results with controls for unobserved heterogeneity.

8. Conclusion

Both in Spain and the Czech Republic, the relative share of young people involved in gross labour market flows between employment, unemployment and inactivity is persistently higher than of prime-age individuals. These age-specific features of gross labour market flows are relatively stable in the Czech Republic. In Spain, however, the youth labour market has responded to the deepening Great Recession by losing part of its fluidity, while the prime-age labour markets have become slightly less tight. As a result of such disproportionate evolutions, the gap between labour market dynamics of both age groups has narrowed in Spain while it has remained nearly the same in the Czech Republic.

The evidence shows a disproportionate increase in youth unemployment rate compared to prime-age unemployment rate. In Spain, this occurrence is mainly driven by the gross flow of young workers from employment to unemployment. Contrary to Spain, in the Czech Republic the disproportionate increase in the youth unemployment rate is mostly generated by the gross flow of young people from inactivity to unemployment. Our results thus signal that the amount of Czech young people who face the difficulty to find a job at the moment of entering the labour market is likely to be the most important factor behind the observed increases in the youth unemployment rate. In Spain, however, the key problem appears to be in the relatively high amount of young workers who are exposed to job losses. Thus the employment policy agenda in both countries should be aimed at reducing/expanding the different types of gross flows to prevent further disproportionate accelerations in youth unemployment rates.

Our analysis of flow transition rates maps the disproportions between the youth and prime-age labour markets from a perspective of an individual. From our main findings we should underline the fact that in the Czech Republic the individual's exposure to risk of job loss and unemployment is remarkably lower than in Spain, a finding which stands true in all analysed age-, educational-, and gender breakdowns. At the same time, in both countries, the job loss rates of young workers are much higher than those of prime-age workers. This gap has further widened in the course of the Great Recession, a tendency which can be interpreted as a remarkable common feature of a disproportionate response of youth labour markets to economic crisis. Viewed from this perspective, the policies aimed at supporting the existing jobs for young people have largely failed in both countries.

Despite heavy deterioration in both countries, the results of analysing the flow transition rates from inactivity to employment still reveal that young Spaniards are slightly better off than young Czechs. This is not to say that youth transitions from inactivity to jobs in Spain are a happy story. Yet, in this particular sense, young labour market entrants in Spain still appear to have better employment prospects than those in the Czech Republic, at least in relative terms. In addition, young people entering the labour market in Spain face a lower individual risk of becoming unemployed compared to young Czechs. Finally, a young labour market entrant in Spain can still hope in a higher average month-to-month probability of finding job than becoming unemployed. In the Czech Republic, the reverse is the case, with unemployment being the more likely destiny of young labour market entrants.

This signals that purely performing youth labour markets with enormously high unemployment rates have not failed in all relevant respects. Currently, their development seems to be hindered predominantly by high risk of job losses and diminishing employment prospects of the unemployed, rather than by impeded transitions from inactivity to employment. In countries with lower youth unemployment rates, unemployment policy agenda appears to be challenged by quite the opposite tendency.

Survival functions depicted in Kaplan-Meier diagrams generally indicate longer unemployment spells and longer job search in the peaking period of the Great Recession. The median survival time as the key indicator of the length of an unemployment episode has increased in both countries and age groups, with much higher dynamics among the young unemployed. In addition, these diagrams report disproportionate increases in long-term unemployment of young people compared to prime age population. It follows that the problems linked with long-term unemployment and marginalisation of young unemployed have strongly gained in significance for both countries in the course of Great Recession.

Hazard model estimations generally confirm that the probability of finding a job is higher with the duration of unemployment spells of under one year. The hazard ratios for chosen duration intervals are typically higher for prime-age unemployed than for the young ones. As for policy relevance of our estimation results, they could provide a certain background for targeting the groups of young unemployed according to the length of their unemployment episodes. It is likely that various activation measures should be shifted beyond the horizon of 3-4 months since within this interval the young unemployed are already best able to find job.

A detailed analysis of explanatory variables shows that the probability of finding job among unemployed university graduates is higher than that of lower education groups. This holds, albeit with lower intensity, for unemployed with secondary education, too. The impact of other explanatory variables on probability to find job, such as gender, age, family size, etc., is less uniform across countries, periods and age groups analysed.

References

- Abowd, J. M., and A. Zellner (1985): "Estimating Gross Labor-Force Flows." *Journal of Business & Economic Statistics*, Vol. 3, no. 3, pp. 254–283.
- Albert, C.; L. Toharia; and M.A. Davia (2008): "To Find or Not to Find a First Significant Job." *Revistade Economía Aplicada*, Vol. 16, no. 46, pp. 37–59.
- Baranowska-Rataj, A., and I. Magda (2013): "Decomposition of Trends in Youth Unemployment - The Role of Job Accessions and Separations in Countries with Different Employment Protection Regimes." Working Paper no. 53, Institute of Statistics and Demography. Warsaw: Warsaw School of Economics.
- Bell, D. N. F., and D. G. Blanchflower (2011): "Young People and the Great Recession." *Oxford Review of Economic Policy*, Vol. 27, no. 2, pp. 241–267.
- Bellmann, L.; S. Estrin; H. Lehmann; and J. Wadsworth (1995): "The East German Labour Market in Transition: Gross Flow Estimates from Panel Data." *Journal of Comparative Economics*, Vol. 20, no. 2, pp. 139–170.
- Blanchard, O. J. (1999): *European Unemployment: The Role of Shocks and Institutions*. Lezioni Paolo Baffi di Moneta & Finanza. Rome: Banca d'Italia.
- Blanchard, O. J., and P. Diamond (1990), "The Cyclical Behavior of Gross Flows of US Workers." *Brookings Papers on Economic Activity*, Vol. 21, no. 2, pp. 85–156.
- Brauksa, I., and L. Fadejeva (2013): "Internal Labour Market Mobility in 2005-2011: The Case of Latvia." Latvijas Banka Working Paper no. 2.
- Burda, M., and Ch. Wyplosz (1994): "Gross Worker and Job Flows in Europe." *European Economic Review*, Vol. 38, no. 6, pp. 1287–1315.
- Cazes, S., and A. Nesporova, eds. (2007): *Flexicurity: A Relevant Approach in Central and Eastern Europe*. Geneva: International Labour Organisation.

- Cox, D. R., (1972): "Regression Models and Life Tables." *Journal of the Royal Statistical Society, Series B (Methodological)*, Vol. 34, no. 2, pp. 187–220.
- D'Addio, A. C. (1999): "Unemployment Durations of French Young People: The Impact of Individual, Family and other Factors on the Hazard Rate." CORE Discussion Paper no. 9851. Louvain-in-Neuve: Université Catholique de Louvain.
- Davia, M.A, and N. Legazpe (2014): "Determinants of Employment Decisions After the First Child Birth in Spain." *Journal of Family and Economic Issues*, Vol. 35, no. 2, pp. 214–227.
- Disney, R.; C. Emmerson; and M. Wakefield (2006): "Ill Health and Retirement in Britain: A Panel Data-based Analysis." *Journal of Health Economics*, Vol. 25, no. 4, pp. 621–649.
- Dixon, R.; J. Freebairn; and G. C. Lim (2011): "Net Flows in the U.S. Labor Market, 1990–2010." *Monthly Labor Review* (February), pp. 25–32.
- ECB (2012): *Euro Area Labour Markets and the Crisis. Structural Issues Report*. Frankfurt: European Central Bank.
- Elsby, M. W. L; J. C. Smith; and J. Wadsworth (2011): "The Role of Worker Flows in the Dynamics and Distribution of UK Unemployment." IZA Discussion Paper no. 5784. Bonn: Institute for the Study of Labour.
- Flek, V., and M. Mysíková (2015): "Unemployment Dynamics in Central Europe: A Labour Flow Approach." *Prague Economic Papers*, Vol. 24, no. 1, pp. 73–87.
- Gomes, P. (2009), "Labour Market Flows: Facts from the United Kingdom." Working Paper no. 367. London: Bank of England.
- Jenkins, S. P. (1997): "sbe17: Discrete Time Proportional Hazards Regression." *STATA Technical Bulletin*, Vol. 7, no. 39, pp. 22–32.
- Kaplan, E. L., and P. Meier (1958): "Nonparametric Estimation from Incomplete Observations", *Journal of the American Statistical Association*, Vol. 53, No. 282, pp. 457–481.
- Kelly, E.; S. McGuinness; P. O'Connell; D. Haugh; and A. G. Pandiella (2013): "Transitions in and out of Unemployment among Young People in the Irish Recession." OECD Economics Department Working Papers no. 1084. Paris: OECD Publishing.
- ILO (2013): *Global Employment Trends for Youth 2013. A Generation at Risk*. Geneva: International Labour Office.
- McGuinness, S., and M. Wooden (2009): "Overskilling, job insecurity and career mobility." *Industrial Relations: A Journal of Economy & Society*, Vol. 48, no. 2, pp. 265–86
- Meyer, B. D. (1990): "Unemployment Insurance and Unemployment Spells." *Econometrica*, Vol. 58, No. 4, pp. 757–782.
- OECD (2013): *The 2012 Labour Market Reform in Spain: A Preliminary Assessment*. Paris: Organisation for Economic Cooperation and Development.
- OECD (2014): *OECD Economic Surveys: Czech Republic*. Paris: Organisation for Economic Cooperation and Development.
- Prentice, R., and L. Gloeckler (1978): "Regression Analysis of Grouped Survival Data with Application to Breast Cancer Data." *Biometrics*, Vol. 34, no. 1, pp. 57–67.
- Shimer, R. (2007): "Reassessing the Ins and Outs of Unemployment." Working Paper no. 13421. Cambridge (MA): National Bureau of Economic Research.

Silverstone, B., and W. Bell (2010): “Labour Market Flows in New Zealand: Some Questions and Some Answers.” Paper Presented to the 51st Conference of the New Zealand Association of Economists, Auckland, 30 June–2 July.

Quintini, G., and T. Manferedi (2009): “Going Separate Ways? School-to-Work Transitions in the United States and Europe.” Working Paper DELSA/ELSA/WD/SEM18. Paris: OECD, Directorate for Employment, Labour and Social Affairs.

Appendix 1: Gross Labour Market Flows in Absolute Numbers

Table 1.1.A: *Gross Labour Market Flows of Young Individuals in Spain*
(monthly averages, in absolute numbers, 2007–2008)

Status in previous month	Status in current month			Σ
	E_t	U_t	I_t	
E_{t-1}	1549133	40932	23234	1613300
U_{t-1}	33830	336778	3280	373888
I_{t-1}	39346	12141	2213313	2264800
Σ	1622310	389851	2239828	4251989

Note: The diagonal figures represent the average monthly numbers of individuals with unchanged labour market status: $(E_{t-1} \rightarrow E_t)$; $(U_{t-1} \rightarrow U_t)$; $(I_{t-1} \rightarrow I_t)$. Off-diagonal figures stand for the average numbers of those who leave every month their previous labour market status and move to another one, i.e., they represent the average monthly gross flows of individuals: $(E_{t-1} \rightarrow U_t)$; $(E_{t-1} \rightarrow I_t)$; $(U_{t-1} \rightarrow E_t)$; $(U_{t-1} \rightarrow I_t)$; $(I_{t-1} \rightarrow E_t)$; $(I_{t-1} \rightarrow U_t)$. The column totals stand for the sum of average stocks of employment, unemployment, or inactivity related to the current month (E_t ; U_t ; I_t). In turn, the row totals correspond to the average labour market stocks of the previous month (E_{t-1} ; U_{t-1} ; I_{t-1}).

Source: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB 2011, version 1 of August 2013. Own calculations from weighted matched samples.

Table 1.2.A: *Gross Labour Market Flows of Prime-age Individuals in Spain*
(monthly averages, in absolute numbers, 2007–2008)

Status in previous month	Status in current month			Σ
	E_t	U_t	I_t	
E_{t-1}	15482683	162967	22716	15668366
U_{t-1}	126902	1416825	9143	552870
I_{t-1}	23442	12402	793743	1829588
Σ	15633027	1592194	1825603	19050824

Table 1.3.A: *Gross Labour Market Flows of Young Individuals in Spain*
(monthly averages, in absolute numbers, 2009–2010)

Status in previous month	Status in current month			Σ
	E_t	U_t	I_t	
E_{t-1}	1003844	33070	14975	1051889
U_{t-1}	29294	589973	8786	628054
I_{t-1}	21898	10205	2595527	2627630
Σ	1055036	633249	2619288	4307573

Table 1.4.A: *Gross Labour Market Flows of Prime-age Individuals in Spain*
(monthly averages, in absolute numbers, 2009–2010)

Status in previous month	Status in current month			
	E_t	U_t	I_t	Σ
E_{t-1}	14256552	179286	21956	14457793
U_{t-1}	162856	2666452	15422	2844730
I_{t-1}	20514	16256	1839699	1876468
Σ	14439922	2861993	1877076	19178991

Table 1.5.A: *Gross Labour Market Flows of Young Individuals in the Czech Republic*
(monthly averages, in absolute numbers, 2007–2008)

Status in previous month	Status in current month			
	E_t	U_t	I_t	Σ
E_{t-1}	327297	2071	1342	330710
U_{t-1}	4073	56916	519	61508
I_{t-1}	6009	2345	730402	738756
Σ	337379	61332	732263	1130974

Table 1.6.A: *Gross Labour Market Flows of Prime-age Individuals in the Czech Republic*
(monthly averages, in absolute numbers, 2007–2008)

Status in previous month	Status in current month			
	E_t	U_t	I_t	Σ
E_{t-1}	3487546	10849	7138	3505534
U_{t-1}	15648	243230	2371	261250
I_{t-1}	7624	2987	559328	569940
Σ	3510819	257066	568838	4336723

Table 1.7.A: *Gross Labour Market Flows of Young Individuals in the Czech Republic*
(monthly averages, in absolute numbers, 2009–2010)

Status in previous month	Status in current month			
	E_t	U_t	I_t	Σ
E_{t-1}	264460	3554	1066	269080
U_{t-1}	5172	82589	894	88656
I_{t-1}	3089	4155	788829	796074
Σ	272722	90298	790789	1153809

Table 1.8.A: *Gross Labour Market Flows of Prime-age Individuals in the Czech Republic*
(monthly averages, in absolute numbers, 2009–2010)

Status in previous month	Status in current month			
	E_t	U_t	I_t	Σ
E_{t-1}	3492039	15349	7327	3514715
U_{t-1}	16555	277942	1702	296199
I_{t-1}	7922	3161	27285	538368
Σ	3516516	296453	536314	4349283

Appendix 2: Flow Transition Rates in Spain

Table 2.1.A: *Flow Transition Rates, Prime-age Individuals* (monthly averages, in per cent)

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	98.81	1.04	0.14	E_t	98.61	1.24	0.15
U_t	8.17	91.24	0.59	U_t	5.72	93.73	0.54
I_t	1.28	0.68	98.04	I_t	1.09	0.87	98.04

Source: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB 2011, version 1 of August 2013. Own calculations from weighted matched samples.

Table 2.2.A: *Flow Transition Rates, Young Individuals*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	96.02	2.54	1.44	E_t	95.43	3.14	1.42
U_t	9.05	90.07	0.88	U_t	4.66	93.94	1.40
I_t	1.74	0.54	97.73	I_t	0.83	0.39	98.78

Table 2.3.A: *Flow Transition Rates, Prime-age Men*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	98.95	0.95	0.10	E_t	98.69	1.20	0.11
U_t	8.44	91.21	0.34	U_t	5.79	93.87	0.34
I_t	1.28	0.71	98.01	I_t	1.31	0.84	97.85

Table 2.4.A: *Flow Transition Rates, Prime-age Women*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	98.30	1.39	0.31	E_t	98.33	1.36	0.30
U_t	7.63	91.29	1.07	U_t	5.53	93.36	1.11
I_t	1.28	0.65	98.07	I_t	0.90	0.89	98.21

Table 2.5.A: *Flow Transition Rates, Young Men*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	96.03	2.62	1.35	E_t	95.33	3.39	1.28
U_t	8.60	90.58	0.82	U_t	4.64	93.87	1.49
I_t	1.77	0.55	97.69	I_t	0.78	0.38	98.84

Table 2.6.A: *Flow Transition Rates, Young Women*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	96.00	2.18	1.82	E_t	95.77	2.32	1.90
U_t	10.94	87.95	1.11	U_t	4.77	94.25	0.99
I_t	1.66	0.51	97.83	I_t	1.01	0.41	98.58

Table 2.7.A: *Flow Transition Rates, Prime-age Individuals with Primary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	98.27	1.57	0.16	E_t	97.92	1.92	0.16
U_t	7.67	91.84	0.49	U_t	5.51	93.95	0.54
I_t	0.85	0.59	98.56	I_t	0.72	0.68	98.60

Table 2.8.A: *Flow Transition Rates, Young Individuals with Primary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	96.04	3.30	0.66	E_t	94.88	4.35	0.77
U_t	7.80	91.51	0.69	U_t	4.13	94.57	1.29
I_t	1.13	0.83	98.04	I_t	0.54	0.50	98.95

Table 2.9.A: *Flow Transition Rates, Prime-age Individuals with Secondary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	99.02	0.86	0.13	E_t	98.94	0.92	0.14
U_t	8.78	90.46	0.76	U_t	5.41	94.15	0.44
I_t	1.43	0.57	98.00	I_t	1.32	1.03	97.65

Table 2.10.A: *Flow Transition Rates, Young Individuals with Secondary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	96.07	1.92	2.01	E_t	95.69	1.93	2.37
U_t	10.32	88.56	1.12	U_t	4.83	93.99	1.18
I_t	1.52	0.26	98.23	I_t	0.74	0.27	98.98

Table 2.11.A: *Flow Transition Rates, Prime-age Individuals with Tertiary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	99.26	0.60	0.14	E_t	99.09	0.77	0.14
U_t	9.49	89.93	0.58	U_t	6.69	92.70	0.62
I_t	2.83	1.17	95.99	I_t	2.06	1.23	96.71

Table 2.12.A: *Flow transition rates, Young Individuals with Tertiary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	95.90	1.35	2.75	E_t	95.88	2.62	1.49
U_t	16.81	81.33	1.87	U_t	7.60	90.51	1.89
I_t	3.93	0.73	95.34	I_t	1.78	0.59	97.63

Appendix 3: Flow Transition Rates in the Czech Republic

Table 3.1.A: *Flow Transition Rates, Prime-age Individuals* (monthly averages, in per cent)

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	99.49	0.31	0.20	E_t	99.35	0.44	0.21
U_t	5.99	93.10	0.91	U_t	5.59	93.84	0.57
I_t	1.34	0.52	98.14	I_t	1.47	0.59	97.94

Source: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB 2011, version 1 of August 2013. Own calculations from weighted matched sample.

Table 3.2.A: *Flow Transition Rates, Young Individuals*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	98.97	0.63	0.41	E_t	98.28	1.32	0.40
U_t	6.62	92.53	0.84	U_t	5.83	93.16	1.01
I_t	0.81	0.32	98.87	I_t	0.39	0.52	99.09

Table 3.3.A: *Flow Transition Rates, Prime-age Men*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	99.67	0.27	0.06	E_t	99.50	0.46	0.04
U_t	6.76	92.88	0.36	U_t	7.39	92.26	0.35
I_t	0.97	0.42	98.61	I_t	0.69	0.27	99.05

Table 3.4.A: *Flow Transition Rates, Prime-age Women*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	99.26	0.36	0.37	E_t	99.18	0.40	0.41
U_t	5.47	93.25	1.28	U_t	4.51	94.79	0.71
I_t	1.44	0.55	98.01	I_t	1.67	0.67	97.66

Table 3.5.A: *Flow Transition Rates, Young Men*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	99.05	0.70	0.26	E_t	98.31	1.41	0.28
U_t	7.92	91.64	0.44	U_t	5.63	93.44	0.93
I_t	1.01	0.42	98.57	I_t	0.42	0.57	99.00

Table 3.6.A: *Flow Transition Rates, Young Women*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	98.85	0.52	0.63	E_t	98.24	1.16	0.60
U_t	5.08	93.59	1.33	U_t	6.22	92.63	1.15
I_t	0.63	0.22	99.14	I_t	0.36	0.47	99.17

Table 3.7.A: *Flow Transition Rates, Prime-age Individuals with Primary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	99.08	0.76	0.16	E_t	98.52	1.27	0.21
U_t	3.03	96.56	0.41	U_t	3.09	96.43	0.48
I_t	0.27	0.33	99.41	I_t	0.28	0.59	99.13

Table 3.8.A: *Flow Transition Rates, Young Individuals with Primary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	97.54	1.89	0.57	E_t	95.79	3.53	0.67
U_t	2.65	96.99	0.35	U_t	3.64	96.04	0.32
I_t	0.13	0.08	99.80	I_t	0.07	0.28	99.66

Table 3.9.A: *Flow Transition Rates, Prime-age Individuals with Secondary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	99.49	0.31	0.20	E_t	99.38	0.44	0.17
U_t	7.14	91.67	1.20	U_t	6.03	93.39	0.57
I_t	1.26	0.54	98.20	I_t	1.45	0.64	97.91

Table 3.10.A: *Flow Transition Rates, Young Individuals with Secondary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	99.10	0.54	0.36	E_t	98.45	1.23	0.33
U_t	8.93	89.86	1.21	U_t	6.50	92.26	1.23
I_t	1.31	0.54	98.15	I_t	0.56	0.75	98.69

Table 3.11.A: *Flow Transition Rates, Prime-age Individuals with Tertiary Education*

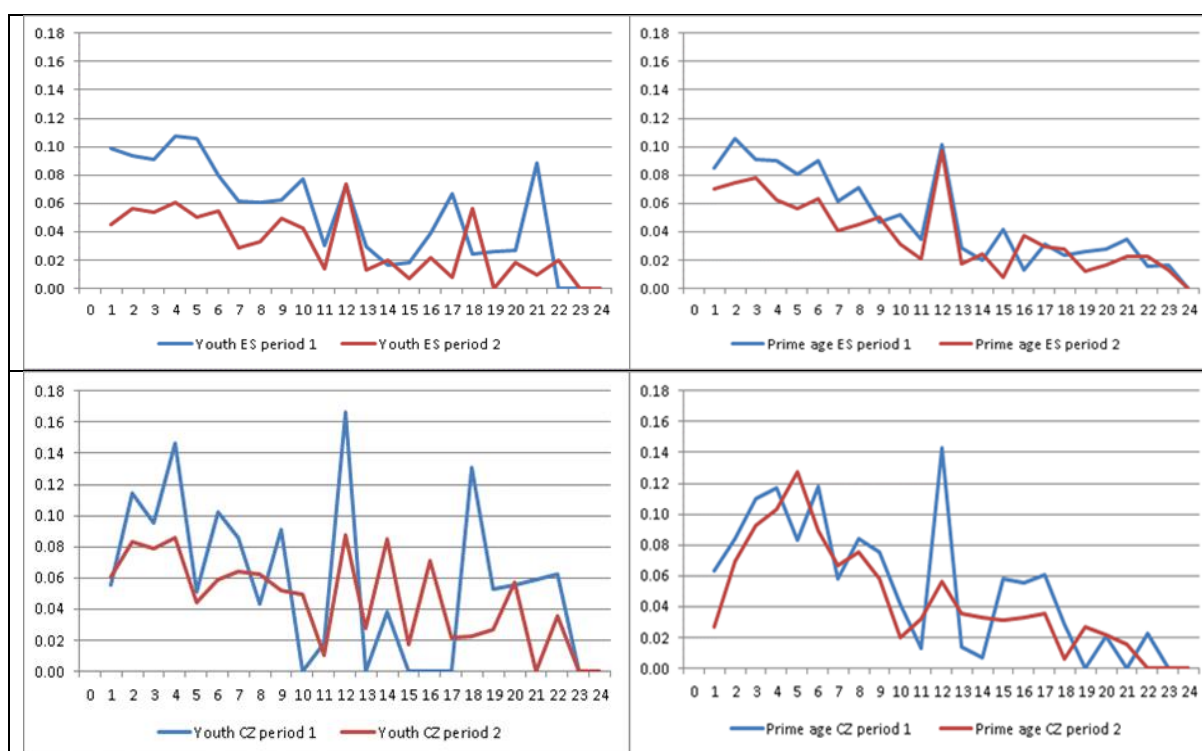
2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	99.62	0.15	0.23	E_t	98.61	0.18	1.21
U_t	10.45	89.07	0.48	U_t	13.03	84.38	2.59
I_t	2.80	0.66	96.54	I_t	1.07	0.50	98.43

Table 3.12.A: *Flow Transition Rates, Young Individuals with Tertiary Education*

2007–2008	E_{t+1}	U_{t+1}	I_{t+1}	2009–2010	E_{t+1}	U_{t+1}	I_{t+1}
E_t	98.88	0.22	0.90	E_t	98.61	0.18	1.21
U_t	22.67	77.33	0.00	U_t	13.03	84.38	2.59
I_t	1.99	0.35	97.66	I_t	1.07	0.50	98.43

Appendix 4

Figure 4.1.A: Estimated Kaplan-Meier hazard functions



Source: EU-SILC LONGITUDINAL UDB 2009, version 4 of March 2013; EU-SILC LONGITUDINAL UDB 2011, version 1 of August 2013. Authors' computations.

Note: The diagrams assign the probability of leaving unemployment and moving into employment in per cent (vertical axis) to each month of unemployment duration (horizontal axis)

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Univerzita Karlova v Praze, Fakulta sociálních věd

Institut ekonomických studií [UK FSV – IES] Praha 1, Opletalova 26

E-mail : ies@fsv.cuni.cz

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